49. (Canceled)

50. (Original) The process of claim 47 wherein the second composition is further defined as comprising from about 75% to about 95% C_7 to C_{10} alkylbenzenes.

REMARKS

The Official Action and the cited references have been carefully reviewed. The review indicates that the claims, especially as amended, recite patentable subject matter and should be allowed. Reconsideration and allowance are therefore respectfully requested.

Prior to contending with the grounds upon which the rejections have been founded, a brief summarization of the essentials of the invention process for converting biomass into a blending component for a petroleum-derived fuel will be described for purposes of better defining the invention and to establish a clearer line of demarcation between the invention process and the processes disclosed in Shabtai et al. '167, Jelks, Lucas and Shabtai '272.

In the art of converting a biomass into a blending component for petroleum-derived fuel in which lignin is extracted in a reaction medium from the biomass to provide a lignin feed material that is depolymerized and subsequently hydroprocessed to provide a blending component for use in a petroleum or petroleum-derived fuel, the present application is the first to use water as an inexpensive reaction medium for inclusion of a alkali hydroxide to obtain high base-catalyzed depolymerization (BCD) activity at low concentrations of the alkali hydroxide– unlike the use of low concentrations of alkali hydroxides in super critical alcohol reaction medium such as methanol and ethanol (where depolymerizing activity of the alkali hydroxide markedly increases at higher concentrations of alkali hydroxide equal to or greater than 10 weight percent.

Claims 1-16, 19, 21-32 and 39-50 were rejected as being unpatentable over Shabtai et al. '167 in view of Jelks or Lucas under 35 USC §103 (a).

Applicants respectfully traverse this rejection and request reconsideration for reasons hereinafter provided.

A careful reading of Shabtai '167 shows that its process converts lignin into a blending component for petroleum-derived fuel by extracting a lignin-containing fraction in a super critical solvent reaction medium from biomass using a base-catalyzed depolymerization reaction. The solvent is a supercritical alcohol, followed by subjecting the depolymerized lignin to a hydroprocessing reaction to produce said blending component. As stressed in Shabtai et al. '167, a super critical alcohol such methanol or ethanol is indispensable to this process (column 7, lines 14-36).

On the other hand, and by contrast, the present invention process utilizes water as the reaction medium, in which the alkali hydroxide is dissolved at low concentrations 2-5 weight percent to provide the major technoeconomic advantage of markedly increased depolymerizing activity, and wherein essentially no difference in lignin conversion exists between 2 weight percent to 10 weight percent inclusion of alkali hydroxide and water (see page 10, line 6 – 25 of present specification). These results are drastically different from the behavior of alkali hydroxide in the supercritical alcohols of Shabtai et al. '167 where the depolmerizing activity of alkali hydroxide in these super critical solvents is low at alkali hydroxide concentrations of 2 to 5 weight percent, but high at alkali hydroxide concentrations equal or greater than 10 weight percent.

While Shabtai et al. '167 may use alkali hydroxides in alcohol-water mixtures (column 7, lines 37-53), no where does Shabtai '167 equate the two.

This deficiency in Shabtai et al. '167 is not compensated for by any teachings in the secondary references of Jelks or Lucas.

Jelks only discloses a process for delignification of cellulosic biomass comprising:

(a) providing a defiberized, lignin-containing biomass of cellulosic material;

(b) reducing the biomass to a fiber slurry of lignin-containing cellulosic material;

(c) modifying the lignin in the fiber slurry by a step comprising in situ formation of nascent oxygen, not occurring as a result of hydrogen peroxide decomposition, in the fiber slurry; and

(d) extracting at least a portion of the lignin from the fiber slurry by washing the fiber slurry with an aqueous solution of an alkaline material.

In other words, the lignin is reduced in a slurry and modified using nascent oxygen, after which some lignin is extracted using aqueous alkaline material; however, there is no reference to or mention of suitability of the final product as a blend in petroleum based fuel.

Lucas et al. disclose a process for producing ethyl alcohol (no reference of use of same as blend in petroleum-based fuels) by:

a continuous treatment of plant biomass using state-of-the-art counter-current extractors to extract salts, proteins and hemicellulose (first extractor); lignin and silica from the residue coming from the first extractor (second extractor); the separation of the lignin from the silicate using an ultrafiltration unit, in plants containing a high percentage of silica; the production of ethyl alcohol (ethanol) from the cellulose coming from the second extractor; and to produce a mixture of lignin and ethyl alcohol (ethanol) as a high energy fuel.

Clearly, only a mixture of lignin and ethanol is produced – as opposed to an aromatic hydrocarbon comprising C_7-C_{10} alkylbenzenes useful as a blend to enhance octane rating of petroleum derived fuel.

Since there is no stated equivalency between water and a mixture of alcohol in water in Shabtai et al. '167, there is no incentive for or reason why one skilled in the art having Shabtai '167 before him would omit the supercritical solvent and use only water as the alkali reaction medium, as required in the present invention process.

Lucas et al. utilizes a multiple extraction process of a plant biomass material to produce a final product that comprises lignin and ethanol - in other words, there is no depolymerization of the lignin or subsequent hydroprocessing to provide a hydrocarbon suitable as a blend in petroleum derived fuel - let alone a C_7-C_{10} alkylbenzene blend for use as a petroleum blending material. Accordingly, even if the feedstock and process from Lucas were substituted for the lignin modification process of Shabtai et al. '167, applicants' invention process as required by the amended claims would not result.

Withdrawal of the rejection is respectfully requested.

Claims 17, 18 and 20 were rejected as being unpatentable over Shabtai et al. '167 further in view of Shabtai et al. '272 under 35 USC §103(a).

Shabtai et al. '167 has been discussed at length above. Shabtai '272 disclose a process for converting lignin into reformulated, partially oxygenated gasoline by:

(a) providing a lignin material;

(b) subjecting the lignin material to a base-catalyzed depolymerization reaction in the presence of a supercritical alcohol, followed by a selective hydrocracking reaction in the presence of a superacid catalyst to produce a high oxygen-content depolymerized lignin product; and

(c) subjecting the depolymerized lignin product to an etherification reaction to produce a reformulated, partially oxygenated/etherified gasoline product.

Accordingly, even if the base-catalyzed depolymerization process using the supercritical alcohol that results in a depolymerized lignin subsequently subjected to etherification reaction to produce a reformulated, partially oxygenated/etherified gasoline product of Shabtai '272 were substituted for the depolymerizxation process of Shabtai et al. '167, applicants' process, which utilizes water as the reaction medium and results in a petroleum fuel blending product of a C_7-C_{10} alkylbenzene would not result.

Withdrawal of the rejection is respectfully requested.

In view of the foregoing amendments, remarks and arguments, it is believed that the application is now in condition for allowance and early notification of the same is earnestly solicited.

Respectfully submitted,

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